the Mechelecty

VOL. 17 APRIL 1958 NO. 5

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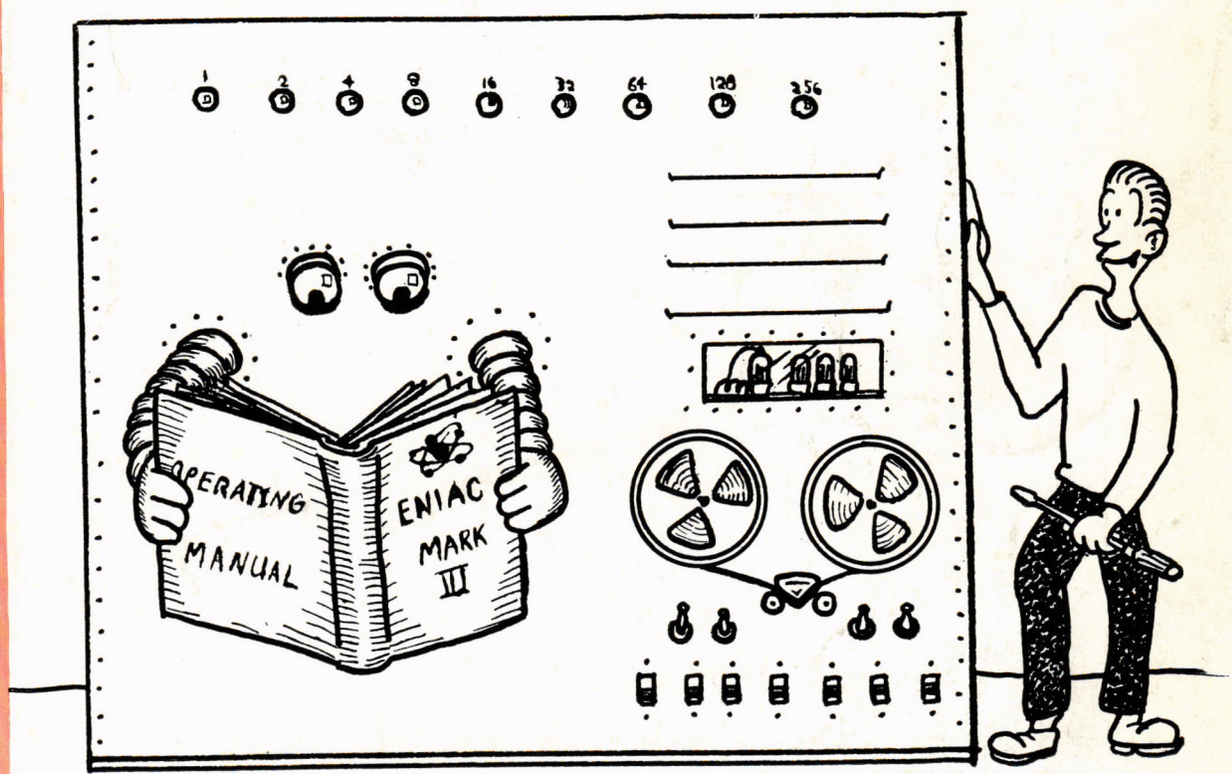


SCHOOL OF ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

APRIL 1958

Picture of a man trying to wreck a train

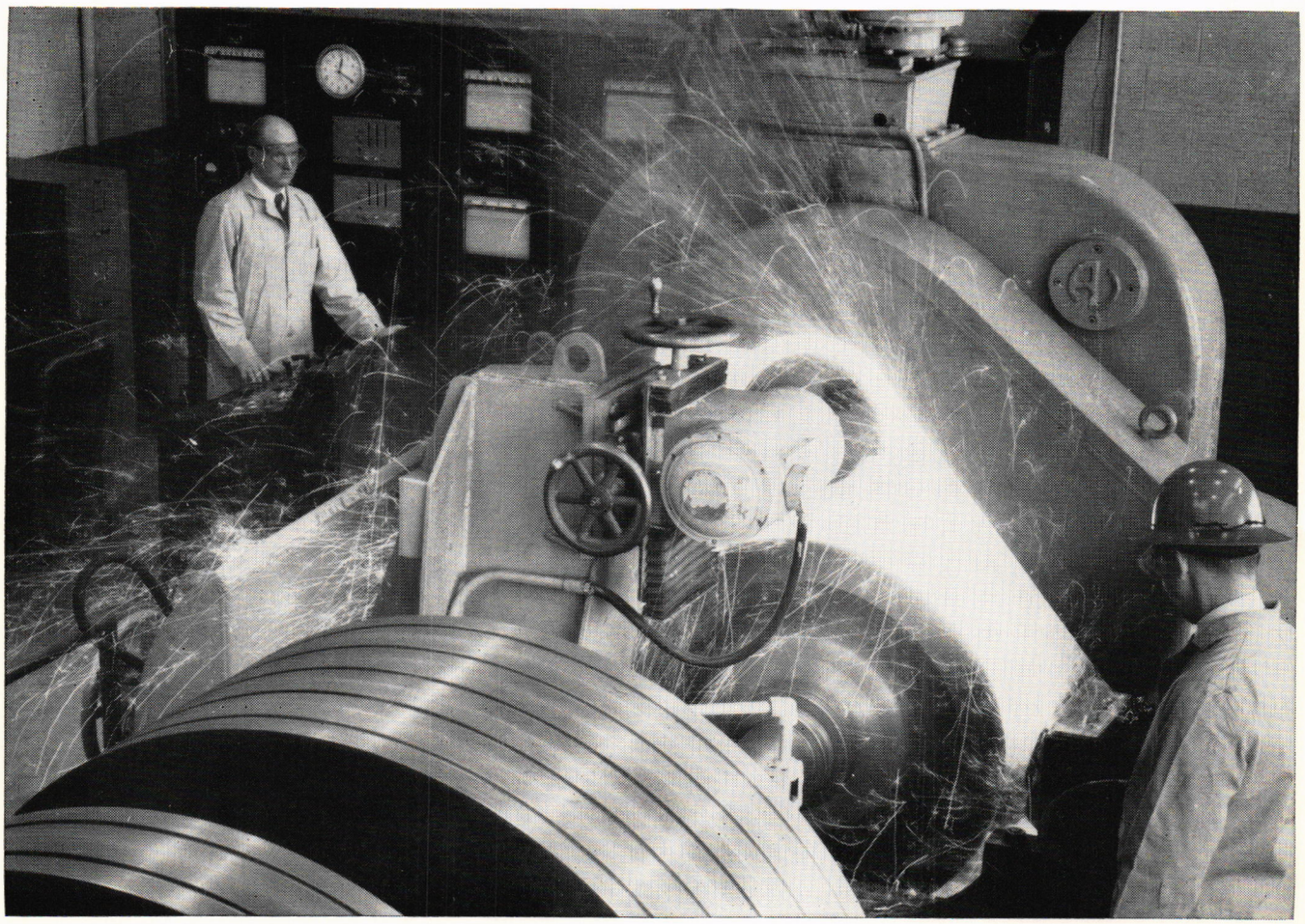
Railroad trains have been clocked at speeds as high as 111 miles an hour. Most trains on open stretches run on a schedule that exceeds 60 miles per hour. Isn't it remarkable, when you think of it, that nobody ever wonders whether the *wheels* will hold up? For many years we have made this our concern so that it would never have to be yours.

To make sure that fast trains will also be safe trains, U. S. Steel research teams carry on a continuing study of railroad wheels at the U. S. Steel Research Center at Monroeville, Pa. Wheels of the type used in high-speed service are subjected to the toughest trials which can be administered on the world's largest inertia dynamometer. Here wheels are driven at speeds equivalent to 160 mph, with the dynamometer generating 68½ million foot-pounds of energy—enough to lift a 34,000-ton ocean liner one foot in the air. These tests show us the minor revisions in design which enable us to maintain the wide safety margin for the ever-increasing speed of operation. Today's wheels would provide complete safety at train speeds which are, as of now, impossible to attain.

This is only one of hundreds of research projects at U. S. Steel directed toward tomorrow's super products. And research is only *part* of the job of making, shaping, treating steel. It's a big job and we need good people to help us—people with your kind of training.

More of our story is told in the booklet, "Paths of Opportunity," which you can obtain by writing to United States Steel, Personnel Division, Room 1662, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS is a registered trademark



USS **United States Steel**

There's a Metal Problem in your future that Inco can help you solve

In the meantime, see if you can tell which Inco Nickel Alloy proved to be the answer to these problems.

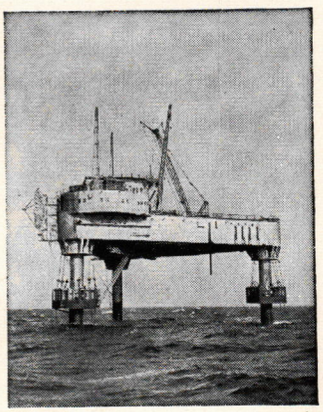
Number the picture captions!

1. **"S" Monel** hard-grade nickel-copper cast alloy
2. **Inco Nickel**
3. **"K" Monel** age-hardenable nickel-copper alloy
4. **Inconel** nickel-chromium alloy
5. **Monel** nickel-copper alloy
6. **Inconel "X"** age-hardenable nickel-chromium alloy
7. **Monel "403"** non-magnetic nickel-copper alloy

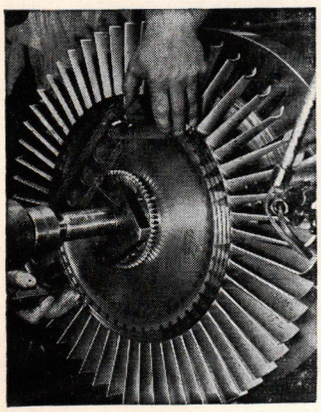
See answers below

☐ **Oil well drill collar** — Needed: non-magnetic metal with high strength. Which Inco Nickel Alloy . . . ?

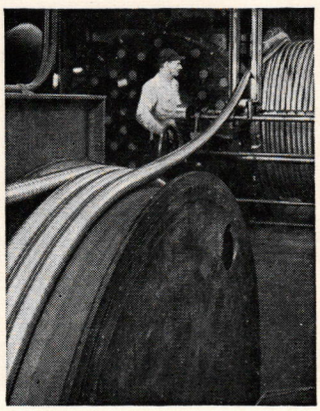
☐ **Jet engine flame tube**—Needed: oxidation and corrosion resistance at jet engine temperatures. Which Inco Nickel Alloy . . . ?



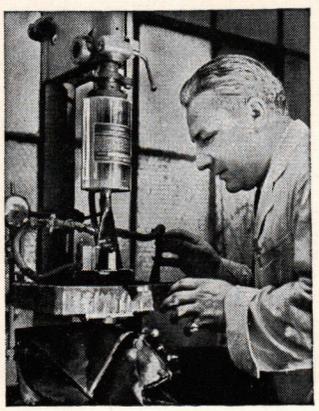
☐ **Radar platform "leggings"** — Needed: resistance to abrasion and marine corrosion. Which Inco Nickel Alloy . . . ?



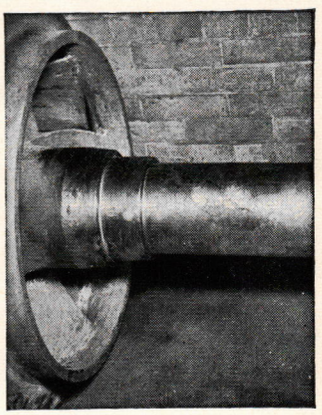
☐ **Gas turbine blades** — Needed: hot strength up to 1500°F., low coefficient of expansion. Which Inco Nickel Alloy . . . ?



☐ **Submarine cable sheathing** — Needed: non-magnetic metal resistant to marine corrosion. Which Inco Nickel Alloy . . . ?



☐ **Ultrasonic drill** — Needed: high magnetostrictive ability to produce ultrasonic vibrations. Which Inco Nickel Alloy . . . ?



☐ **Shaft sleeve for salt water pump** — Needed: extra-hard casting alloy that resists corrosion. Which one . . . ?

You may have to take this kind of quiz *again*. You may be designing a machine which requires a metal that resists corrosion . . . or wear . . . or high temperatures. Or one that meets some destructive *combination* of conditions.

When you start to design equipment, you will have to select the proper material to meet given service conditions. Over the years, Inco Development and Research has successfully solved many metal problems, and has compiled a wealth of information to help you.

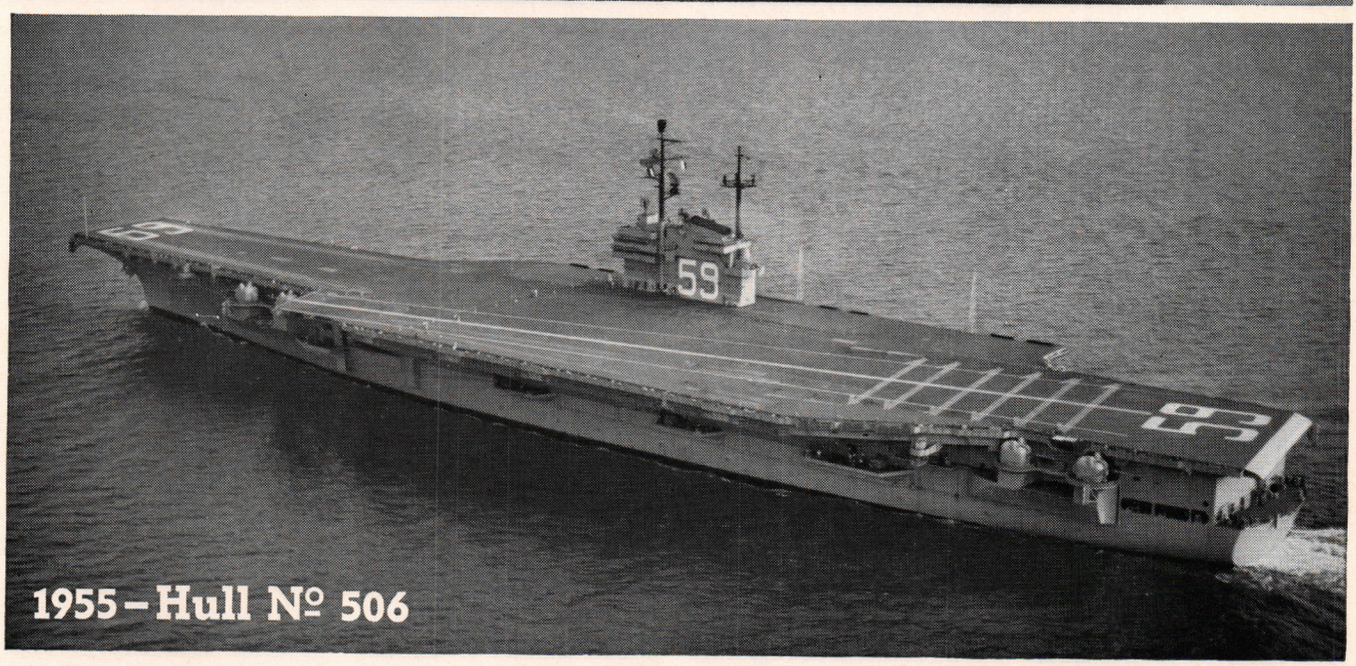
For more on special problems solved with Inco Alloys, send for "Standard Alloys." Write The International Nickel Company, Inc., Dept. 00, New York 5, N. Y.

The International Nickel Company, Inc.
New York 5, N. Y.

Oil well drill collar: 3. "K" Monel; Jet Engine flame tube: 4. Inconel; Radar platform "leggings": 5. Monel; Gas turbine blades: 6. Inconel "X"; Submarine cable sheathing: 7. Monel "403"; Ultrasonic drill: 2. Inco Nickel; Pump's shaft sleeve: 1. "S" Monel

Inco Nickel

makes metals perform better longer



What do both have in common?

THE PRESS GAVE UNRESERVED ATTENTION to Newport News Hull Number 506 . . . the mighty 1039-foot aircraft carrier *Forrestal* . . . world's greatest fighting ship and forerunner of a new class of fighting ladies for the U. S. Navy.

But take a look at Newport News Hull Number One, built in 1890.

Originally christened the *Dorothy,* this hull is now the *J. Alvah Clark.* And, today, 65 years after Newport News built it, Hull Number One is still in operation . . . serving regularly in the fleet of the Curtis Bay Towing Co.

You could place 145 vessels the size of the *J. Alvah Clark* on the flight deck of the *Forrestal.*

Yet both Hull Number One and Hull Number 506 have one characteristic in common: the quality built into every vessel ever constructed at Newport News. In fulfillment of the pledge of the founder that . . . *"we shall build good ships."*

Engineers . . . Desirable positions available in this commercial shipyard. Representatives at Placement Office annually. Arrange a personal interview or write Personnel Manager.

Newport News
Shipbuilding and Dry Dock Company
Newport News, Virginia

the Mecheleciv

VOL. 17 APRIL 1958 NO. 5

SCHOOL OF ENGINEERING, THE GEORGE WASHINGTON UNIVERSITY

In This Issue:

ARTICLES

DEPARTMENTS

Published at the George Washington University by direction of the Engineers' Council. Published six times during the school year in October, November, December, March, April, and May. Entered as second class matter March 6, 1951, at the Post Office at Washington, D. C., under the act of March 3, 1879. Address communications to Mecheleciv Magazine, Davis-Hodgkins House, George Washington University, Washington 6, D. C. or telephone STerling 3-0250, Extension 528.

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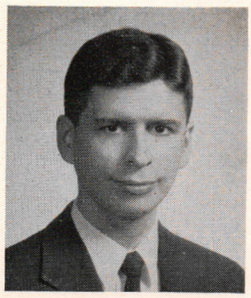
Subscription Price: Two Dollars

Familiar Faces

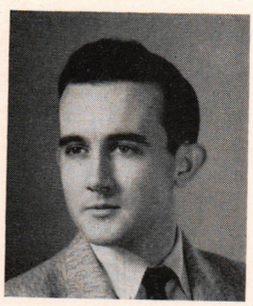
JAMES R. LEAR, BEE '59, was born here in Washington and attended high school at Western High School. After graduation in '48 he went to work at the National Metropolitan Bank and went to work at G.W. at night. The ability to handle money carried over into Jim's Navy hitch from '51 to '55. During Jim's sea duty he was the senior Disbursing Clerk aboard the Aircraft Carrier USS Coral Sea. While aboard ship, Jim visited many interesting ports in such places as the Caribbean and Mediterranean.



When Jim left the Navy in the Spring of '55 he went to work at Melpar. In the Fall he started back to school here at G.W. and took a night job with the bank. Although he's an EE student, Jim still has a feeling for money. He is MECHELECIV Business Manager, Engineer's Council Treasurer, Theta Tau Treasurer, Pi Delta Epsilon Treasurer, and is running for Comptroller of the Student Council. Jim has also been MECHELECIV Circulation Manager and is a member of AIEE-IRE, Old Men and Sigma Tau.

JACK O'NEALE (spelled with an "E") is one of our shorter students but packs enough enthusiasm for two men. Wherever Jack is you can count on things to be lively.

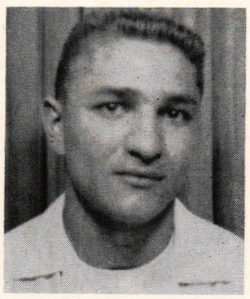
Washington, D. C. is Jack's hometown and he attended Gonzaga High School. After high school he went to Notre Dame for two years. Two years were enough at Notre Dame and he decided to come back here to work and go to school. Jack works for Johnson Service Company as a technician and draftsman. He plans to get a BSME degree and then continue as a graduate student if Uncle Sam doesn't send him greetings.



Jack's willingness to work and his executive ability is pointed out by his recent election to Regent of Theta Tau. He is also active in ASME and D-H House bull sessions.

The love of Jack's life (women are too sober) is a '31 Chev roadster. This is low on horsepower but high on personality. Jack is also interested in sports cars and would like a Porsche Spider to supplement the Chev roadster.

RALPH DELALLA is a very busy person about school. He is the present Circulation Manager for MECHELECIV, D-H House Manager and Sophomore Representative to the Engineers' Council. Besides all of this he is going to school full time.



improve the Engineers' Study this semester to make the D-H House wore livable and attractive. The new floor lamps, rug, coffee table, etc., attest to the interest that he has taken in the house. Ralph has still more plans to further improve the Engineers' Study House.

A native of Washington, Ralph grew up here in the District. He graduated from Saint John's High School and selected G.W. so that he could continue his schooling in D. C.

Electrical Engineering is going to be Ralph's specialty. He was employed by Melpar at one time. When Ralph finishes at G. W. he hopes to do research in the EE field. Whatever he does he will be a success at it. He is a very cooperative and dependable worker and pleasant to work with.

ANN ATKINS is only in her second semester here at school but is already a very familiar person about the campus. The first semester she was Copy Editor for MECHELECIV. Ann did an excellent job as Copy Editor and helped with so many other tasks that she had to give up her job on the staff to allow more time for study. The typical Atkins response to an assignment is to accomplish it at once if not sooner. This attitude is perhaps a carry-over from the Marines since her father is a retired Marine Major.

Ann was born in Washington and attended Washington-Lee High School.

When you visit the D-H House, look around and see if you don't detect a womanly influence. The windows have drapes, new rugs are on the floor and there are new lamps and a coffee table. Ann has worked with the house manager to bring about these pleasant changes.

While you are admiring the new drapes sniff the air—perhaps you are in time for spaghetti and meat balls. Ann along with her other talents is a very proficient cook. She also likes to swim, play the piano and work with ceramics.

trying to catch the brass ring?

better forget it!

No engineering position
worth getting
can possibly offer you
a "free ride".

The old rules still apply:
a successful career
depends on the amount of
ability you have
and on the capacity of a company
to make good use of that ability.

Sikorsky helicopters
have amply demonstrated
our capacity
for putting engineering talent
to constructive use.

They are the most versatile,
most widely used rotary-wing aircraft
in the world today.

For factual and detailed information about careers with the world's pioneer helicopter manufacturer, write Mr. Richard L. Auten, Bridgeport Personnel Department.

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COMPUTERS

Fundamental Concepts of . . .

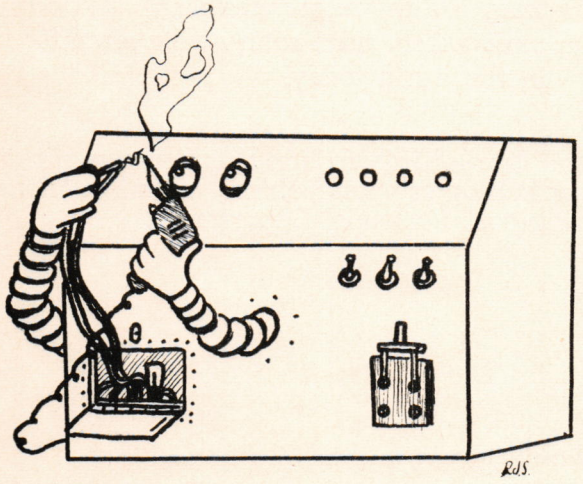
By CLIF HALL, B.E.E. '61

The school now has a computer, but what can it do and how does it do it? The name "automatic computer" brings to the average mind a picture of a fantastically complicated machine. However, as in any machine, the basic ideas behind the computer are simple. Each small unit is a simple fundamental piece of mechanism, either electrical or mechanical. Only in the assembly of the units into one machine does it become complicated.

When one obtains a basic knowledge of what a computer is and how it works, the circuitry and gadgetry used is much easier to understand.

A machine or a person who can perform a sequence of operations on supplied information and give out answers is a computer. A mathematician with pencil and paper and a digital computer may both be computers working on the same problem. The digital computer may be much faster and arrive at the answer in a different manner, but the information supplied and the answer are the same.

The information supplied to a computer can be in any form as long as it has meaning and the computer knows the meanings. Holes in cards, marks or words can all be identical in meaning. If the code system used says a large hole in a card followed by a small hole is 2, then the product of two sets of these holes is 4. The computer may give out the answer as another series of holes in a card or on a teletype. The means of communication is important only in that the information supplier and the computer understand it.



What kind of a sequence of operations can an analog or digital computer perform on information? The operations must be logical or mathematical. Mathematical operations can be anything from sum and product operations to differential equations or vector analysis. A logical operation is integrating data, matching, selecting, sorting or determining what is to be the next instruction.

A logical operation on information must have the following properties. It does not question the truth or objectivity of supplied information. It only determines the implications of the data.

How would a computer answer the following argument? Death Valley is below sea level. Water seeks its own level. Death Valley is under water. The argument is objectively valid for a computer. A computer can only derive conclusions and not analyze the objective truth of supplied information.

The speed of the automatic computer is a result of this disregard of the meaning of the information. Take for instance the solution of the equation:

$$f(x) = f(a) + f'(a) \cdot \frac{(x - a)}{1!} + f''(a) \cdot \frac{(x - a)^2}{2!} + \ldots$$

If the computer is supplied with "x" and "a", the solution is practically instantaneous. If the machine had to consider the meaning of the equation, the answer obviously wouldn't be instantaneous.

A machine must be able to remember information to be able to act on it. To remember, a machine must record. A common way of recording data is

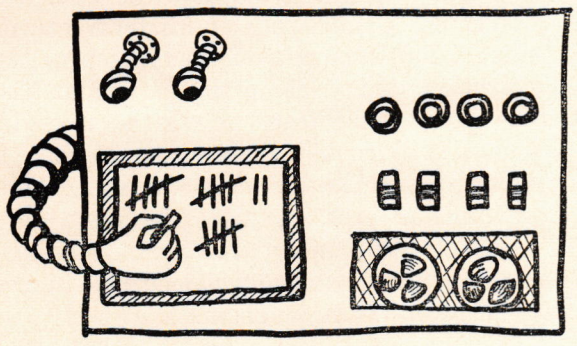
through holes punched in cards. The card is inserted in the machine and the holes or absence of holes is detected by the machine and the pattern of information is stored. This form of information storage is digital and can be in the form of any distinct series of symbols. The digital machine must remember each bit of information, a short or a long time depending on its function in the problem. It is stored either mechanically or electrically in a part of the machine called a register. The amount of information that can be stored simultaneously is only limited by the size of the machine.

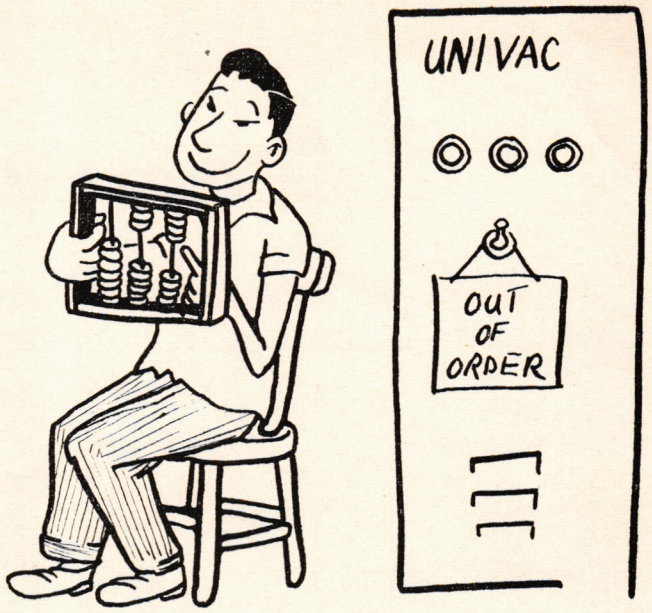
Another way of supplying information to a machine is by turning a wheel or a dial. This causes the machine to record the magnitude of the turn. This type of information storage is analog and is always a magnitude. The information is generally remembered for the entire length of the problem in a separate mechanism. This can be done by the rotating of a shaft, the positioning of an input to a multiplier or the positioning of a cam follower, etc. Here also the quantity of information stored is only limited by the size of the machine. The manner of storage in an analog machine, however, necessitates much more space than the digital machine requires. In an analog machine, each mechanism is physically connected in a way to reflect their mathematical relationship. The simultaneous changing of all of the mechanisms solves the problem.

It is possible to build a machine that will receive both digital and analog information. In this way the best features of both could be utilized.

An analog machine handles and manipulates information in a different way than the digital machine. An input to an analog machine, to be multiplied may come in on a shaft. It is multiplied by a gear ratio or a mechanical multiplying mechanism. The output is then sent out on another shaft. This is very simple, but the mechanisms are bulky.

The digital machine's operation is more complex, but takes less space. The computer is arranged like a track system with four stations: input, storage, calculator, and input. Each station can have any number of sections or registers. If two quantities





are to be worked on, the calculator would have an "A" and "N" register and a register "Op" for the operations.

For instance, if 6 were to be divided by 2, the number 6 is flashed to register "A" and the number 2 to register "B". Divided is flashed to register "Op" and the number 3 (the answer) is then flashed to a register in the output section. Of course to perform any operation the machine must have what amounts to a built-in multiplication table or formula.

An automatic computer is merely one that can operate by itself. Information is fed in and the answers come out. The real hitch is in programming the information in a language which the computer can understand. A very human trait indeed for a machine to have.

The secret of the computer is a very simple one . . . a machine can be built to follow a series of instructions no matter how complex, and to manipulate them according to circumstances.

The application of this simple concept is rapidly changing our world. Computers can handle an amazingly large variety of operations. These versatile machines can be built to handle complicated mathematical calculations or routine clerical work. As with many scientific advances, the computer has stirred up controversy. Strong Union opposition to computers has been asserted on the basis that it will mean fewer jobs. The advent of the computer will no more cause a decrease in employment than the sewing machine did. Many people will be released from routine jobs and can be absorbed into the scientific and technical fields. Rather than a detriment to our economy, the computer will be the means to further increase our standard of living and will help make possible the conquest of space.

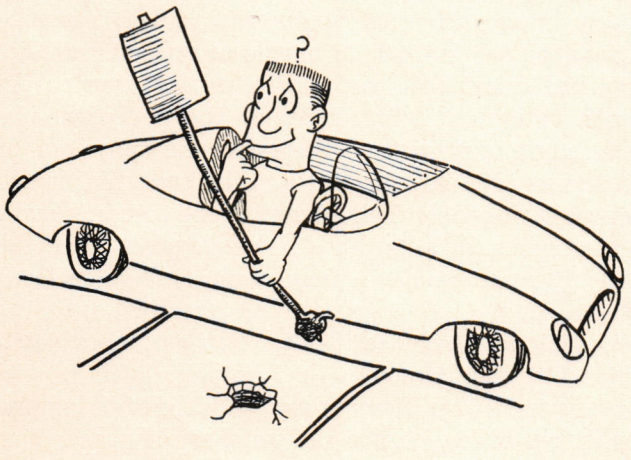
READING

Graduate from comics to texts . . .

By PATRICK CUDMORE

Tests have shown that the average adult reads at the level of a seventh grade student. He reads at this level, which is 250 words per minute, because of his assorted poor reading habits. Basically these are, lip movement, throat movement, internal reading (hearing words in one's mind), word-by-word reading, involuntary backward movement of the eyes over previous words (regression), poor vocabulary, and passive reading with no attempt to develop an interest in the text. At least one of these belongs to each of us. How many do you claim?

As an illustration of regression, a statement that might be found in a trigonometry text will be used. The poor reader will probably present a thought train to his mind that could be very similar to this. "The sum of the squares—the sum—of the sides of a right angle—squares of the sides—equals—the square of the hypotenuse." This can be very misleading and confusing. Contrast this to the thought train that a good reader will present to his mind: "The sum of the squares of the sides of a right triangle equals the square of the hypotenuse." The latter statement is without question, a much clearer and more meaningful statement than the former. All of the remaining poor reading habits could be analyzed in much the same manner, and they appear just as ridiculous—so ridiculous that it is a wonder that we retain them at all.



Let us introduce Joe Smith, an average college student, who has good reading habits; now keep an eye on Joe when exam time rolls around. On one particular exam he neglected 100 pages of required reading until one hour before the exam. But don't fail Joe because he has been attending classes and paying attention. Joe grabs his book, opens it, and skims—picking out key words, ideas, and topic sentences. Almost before he realizes it he has covered the material and has time to spare. Joe's chances of getting a good mark are reasonably good because he has devoted that 45 or 50 minutes to intense, concentrated reading. Essentially this is what everybody should do when they read—read for ideas, and topic sentences and let the individual words take care of themselves. However this is not always easy to do, machines have been invented to help us; they are: the shadowscope, the tachistoscope (T-scope), and the controlled reader.

The shadowscope consists of a light source that is projected on a variable speed moving mirror. The mirror reflects the light beam, and the light beam moves down the printed page of whatever you may be reading. The student's job is to keep up with the light beam, and in doing this he automatically reads faster and concentrates on what he is reading. If the student finds he can read faster than the light beam travels, he increases the speed of the mirror which in turn increases the speed of the light beam on the printed page which makes the student again read faster and concentrate in order to keep up with the light beam.

The T-scope is a device similar to an ordinary slide projector, but one with an adjustable shutter speed. It flashes numbers and phrases on a screen in 1/1000 of a second or less, and the student writes down what he sees immediately. This tends to widen the eye span and to develop speed and accuracy.

The controlled reader is a fast slide projector which flashes printed matter, a line at a time, on a screen at a variable rate (to 1000 wpm). It is set at a speed which is just above the student's normal reading speed, and it encourages him to organize facts and ideas at a high level of accuracy.

Now just what results can we expect from the use of these machines? The table below shows the results of 15 reading classes held at the U. S. Naval Gun Factory, Washington, D. C. These results are the average results of each individual class. Notice that both the speed and the comprehension have increased in each case. The average over-all reading speed increase is 84% and the average over-all comprehension increase is 28%.

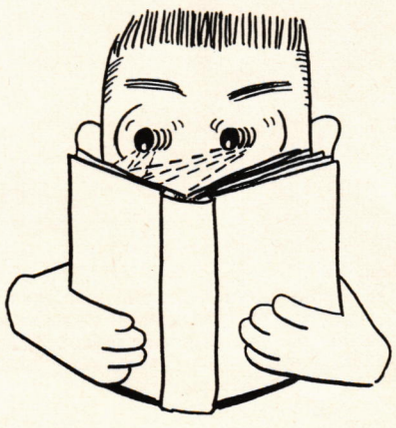
No. of	Initial		Final		Percent Increase	
Students	WPM	COMP	WPM	COMP	WPM	COMP
23	344	75	544	80	58	7
23	344	75	570	84	66	12
24	261	59	433	77	66	30
24	295	58	562	78	90	34
24	210	61	348	81	66	33
24	181	64	387	77	114	20
21	254	63	404	78	59	24
19	242	53	434	76	79	43
19	209	60	439	80	110	33
20	253	59	428	78	69	32
20	346	59	730	76	111	29
14	223	64	428	78	92	22
14	229	59	496	68	116	15
8	265	51	465	80	76	57
10	223	61	437	82	96	34

The question that now arises is what good will this fast rate do in reading a technical publication. It is true that we read technical papers slower than novels, but we still stand to gain more speed and save more time in technical reading. However, the student must be diligent, and constantly trying to improve his reading ability in order to avoid the pitfalls of regression, passive reading, etc.

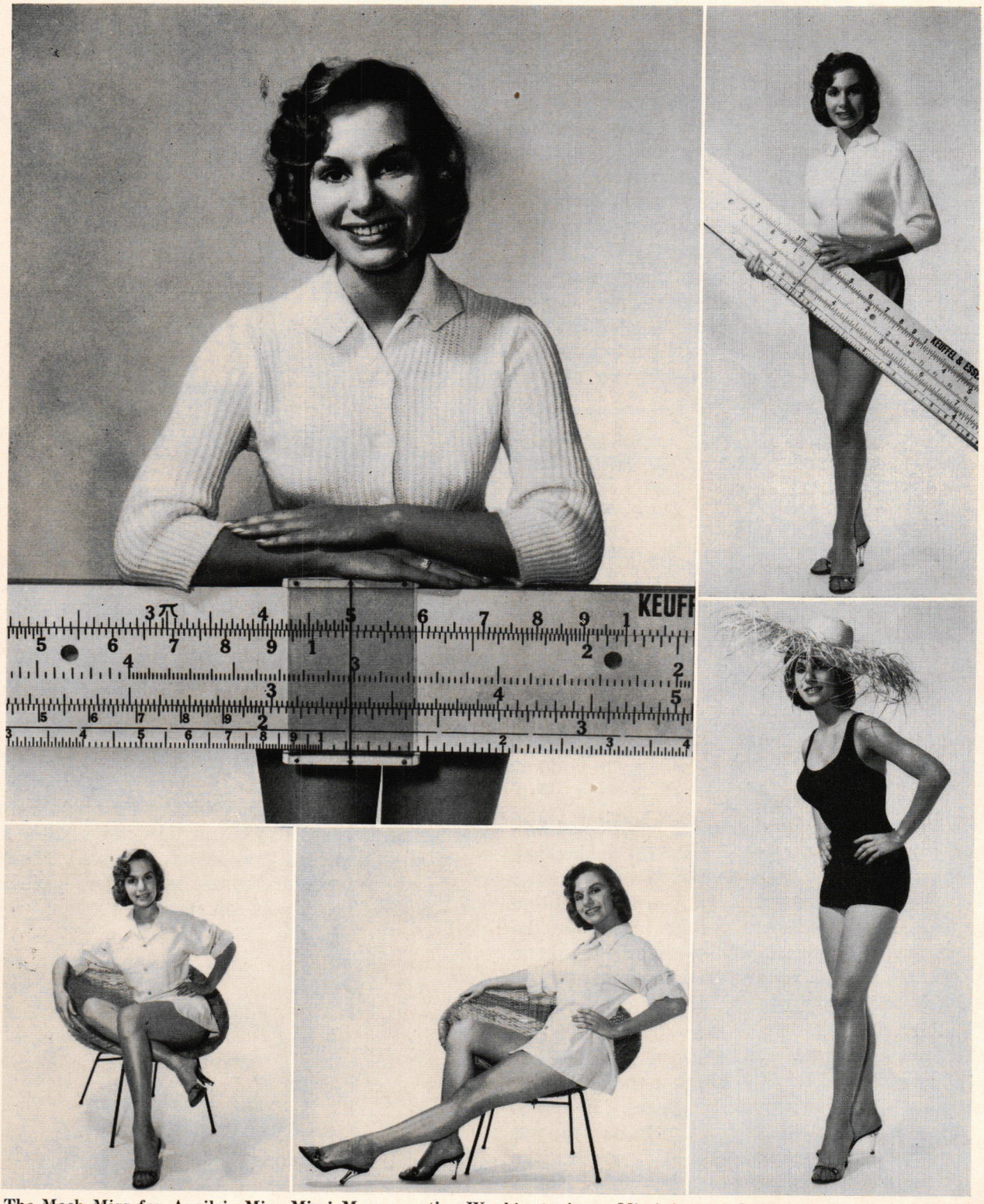
Thurman Wade of Wilmington, California, is the world's fastest reader at 6,200 wpm with 90% to 100% comprehension. He says that the only thing that holds him up is turning the pages. It's up to you to covet Mr. Wade's crown. On our campus at the Reading Clinic, 802 21st St., you may sign up for a seven-week course costing $53.00. Reading faults and vocabulary are handled for three hours a week, and the machines described herein are used another three hours a week. The only drawback is that the course is given without college credit.

You may study in your spare time at home and become a better reader. Two inexpensive books (out of many) written for this purpose are: *How to Become a Better Reader,* by Paul Witty, Science Research Associates, Inc., at approximately $5.00, and *Efficient Reading,* by James J. Brown, D. C. Heath and Company, costing about $3.00. These books contain reading exercises which in themselves point out the various errors in reading and how to correct them.

Lastly, if you are ambitious and want to increase your reading speed, you can take any reading matter at all and read it as fast as possible. The start of your new reading career might very well be to re-read this article at top speed.



MECH - MISS

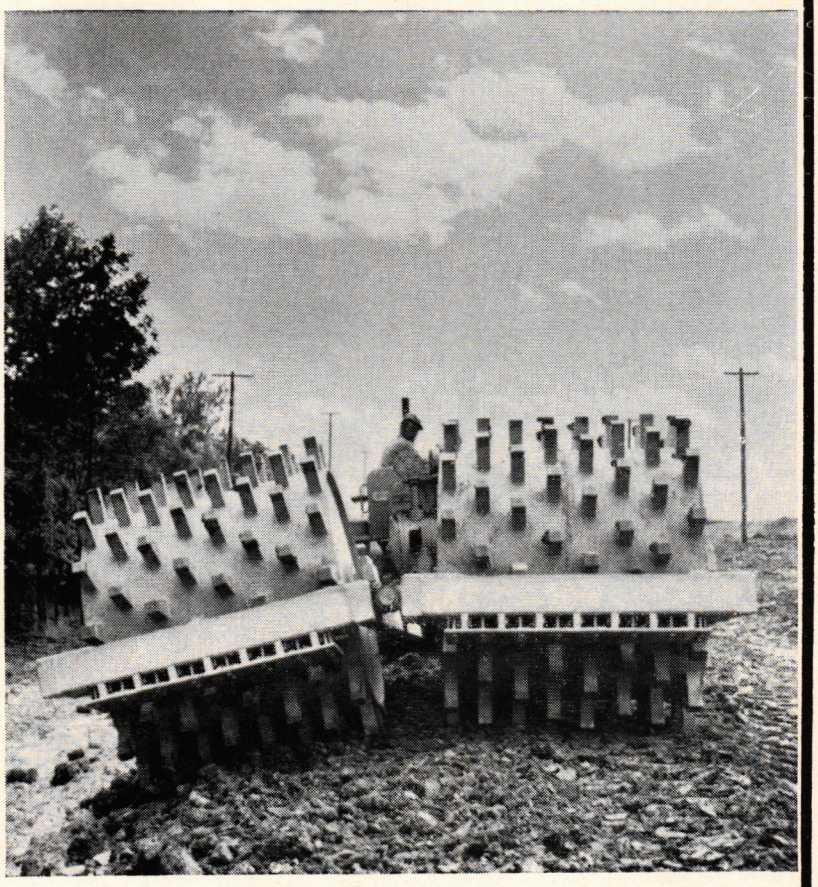


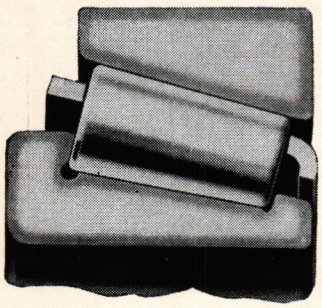
The Mech Miss for April is Miss Mimi May, a native Washingtonian. Mimi is completing her freshman year, majors in Home Economics, and is a member of Alpha Epsilon Phi sorority. She recently captured the title of "Miss Venus" at the first annual Sigma Chi Derby Day. It's not difficult to see why. Her 112 pounds are very pleasantly distributed over her 5-foot 3½-inch height. For the benefit of the scientifically minded readers, the slide rule problem came up with an answer of 35-23-36.

Tear out this page for **YOUR BEARING NOTEBOOK...**

How to take 22½ ton impacts on drum axle

The designers who built this giant tamping roller had to contend with impacts as high as 1450 psi on the drum axle. To take these terrific loads, designers mounted the drum axle on Timken® tapered roller bearings. Timken bearings are case-carburized to produce hard, wear-resistant surfaces over tough, shock-resistant cores. Their full-line contact between rollers and races gives them extra load-carrying capacity. And because they practically eliminate friction, they help heavy construction machinery start and roll more easily.





Slice a Timken bearing in half and see why it takes shocks

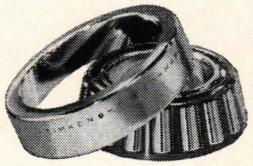
The picture at left shows what you'd see if you cut through a Timken bearing: hard, wear-resistant surfaces and tough, shock-resistant cores.

Want to learn more about job opportunities? Timken bearings help make better machines—machines that enrich our lives. It's what the Timken Company calls Better-ness. If you'd like a career helping to create the machines that create Better-ness, write for: "BETTER-ness and your career at the Timken Company". The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ↓◫↑ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

Muzzle Page

with Frank Narr

1. *Get a Calculator:* When is the sum of the squares of two successive integers a perfect square?

2. *Typical Enginering Lingo:*
X: "Give me two mine and I become twice as you."
Y: "And if I got the same from you, I am four times as much as you."
How much each are X and Y?

3. *Inventory:* Three travelers came to a tavern and ordered a dish of potatoes. When the landlord brought in the potatoes the men were all asleep. The first of the travelers to wake up ate a third of the potatoes and went back to sleep without disturbing his companions. Then another awoke and not realizing that one of his companions had already eaten, ate a third of those he found and went to sleep again. Finally the third man did the same, eating a third of the potatoes that were there and going back to sleep. When the landlord came to clean the table he found 8 potatoes. How many had he prepared?

4. *Careful Now . . .* While three watchmen were guarding an orchard a thief slipped in and stole some apples. On his way out he met the three watchmen one after the other and to each in turn he gave a half of the apples he then had and two more besides. Thus he managed to escape with one apple. How many had he stolen originally?

5. *Tight Squeeze?* Suppose the earth were a perfect sphere 2500 miles in circumference and suppose it were possible to erect a telephone line on poles about the equator. Assuming that the telephone wire would then form a circle concentric with the equator, would a man be able to crawl under the wire without touching it if the total length of the wire exceeded the circumference of the earth by only 2 feet?

6. *Physical Measurements:* A grocer attempts to weigh out identical amounts of sugar to two customers, but his scales are false. The first time he puts the weight in one pan and the sugar in the other; the second time he reverses the procedure. Does he lose or gain?

7. *Money and Beggars:* If Wayne D. were to give 7 cents to each of the beggars at his door, he would have 24 cents left. He lacks 32 cents of being able to give them 9 cents apiece. How many beggars are there and how much money does Wayne D. have?

APRIL ANSWERS

1. $0^2 + 1^2 = 1^2$
$3^2 + 4^2 = 5^2$
$20^2 + 21^2 = 29^2$
$119^2 + 120^2 = 169^2$
In addition there are five larger sets of which $803760^2 + 803761^2 = 1136689^2$ is the largest.
2. 3 5/7 and 4 6/7.
3. 27.
4. 36.
5. Yes.
6. He loses.
7. 28 beggars and $2.20.

MARCH ANSWERS

1. The monkey would make 19 movements in all and would have climbed 19 feet.

2. According to the mathematical logic and reasoning ability of the waiter, A had $12, B had $20, and C had $30. (Ten minutes later the house had it all.)

3. 10 inches or thereabouts, but while she was little there, Brother—she did certainly know her figures.

4. All he had to do was to tilt the bucket over and if any part of the bottom could be seen without the milk running out, he knew it was not half full.

5. Quicker than it has taken to relate, she relieved A of $88 and B of $44.

are your **pencils** as sharp as your **perspectives?**

Efficiency reaches the vanishing point when you work with an inferior pencil—but hits a new high when you pick up an Eagle TURQUOISE. This is the drawing pencil that ranks first with professionals, and these are the reasons: 1. It gives you *uniform grading* (17 scientific formulas guarantee exactly the blackness you want—from every pencil, every time!). 2. It takes a strong *non-crumbling needle point* that stays sharp for line after long line of unchanging width. 3. You get inimitable smoothness—thanks to Eagle's exclusive "Electronic" graphite. TURQUOISE makes your perspectives look sharp—and *you*, too!

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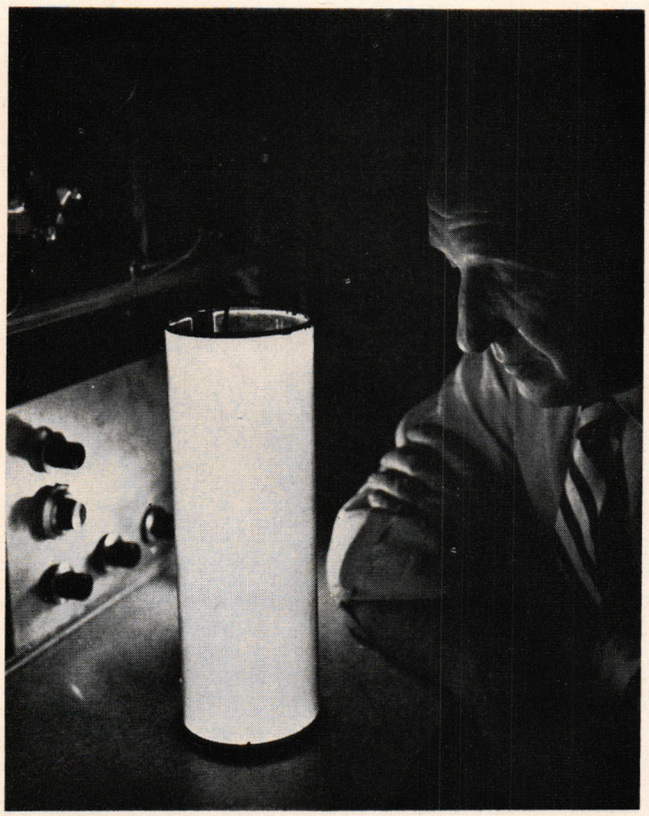
NEWS IN INDUSTRY

FLEXIBLE LIGHT SOURCE

"Electroluminescence"

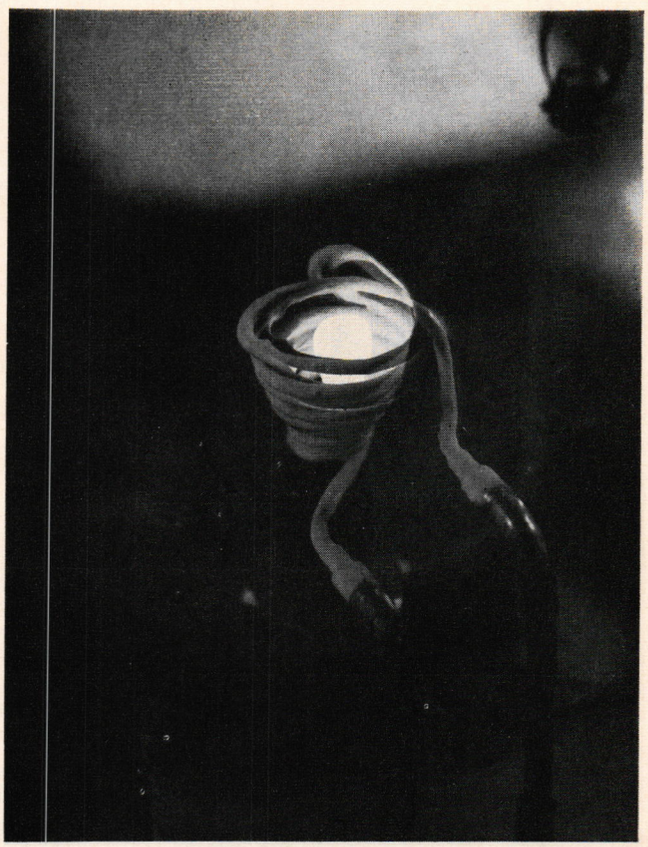
To the casual glance, this bright cylinder might resemble nothing more remarkable than a glass wind-screen around a high-output candle. To researchers in electroluminescent lighting the cylinder is a bit more complex and interesting: it demonstrates how an opaque fabric woven from stainless steel wire can become a flexible light source when coated with phosphors and a transparent conductive material. Before it was curled into a cylinder, the steel fabric was twelve inches square and lay flat upon the lab bench. Other flexible light sources have been made with a nylon base. Light output visible here resulted from the application of 250 volts at 4000 cycles.



Flexible light cylinder.

LEVIATION MELTING

"Short cut to wonder metals"



Floating metal in coil.

Man's newest wonder metals are now being investigated by heating them thousands of degrees above white heat, while they float freely suspended in space. Called levitation melting, this unique and versatile technique was developed by Westinghouse and the University of British Columbia.

Levitation melting is used to prepare highly purified laboratory-scale ingots of niobium, zirconium, titanium, molybdenum and dozens of alloys. Compressed metal powder is placed inside a copper coil which carries a high-frequency current of electricity. Reversing its direction nearly a million times a second, the electric current generates a field of

(Continued on page 16.)

To **engineering undergraduates**

who want to plot a better

career curve...

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force which floats the metal charge inside the coil. At the same time, it converts the metal into a white-hot molten mass in a matter of seconds. Temperatures of 4500 to 5000 degrees Fahrenheit are achieved in half a minute or less.

At white heat, metals such as niobium and titanium are among the most active chemicals known. They react chemically with any known vessel in which they are melted. The traces of impurities they pick up cannot be tolerated in research on the pure metal. Levitation melting eliminates this problem entirely. No containing vessel is required, since the molten metal floats freely in space, confined only within itself. The whole process is carried out inside a sealed vessel containing an inert gas such as helium or argon, thereby protecting the pure metal from contamination by the air.

Simplicity of apparatus, speed of melting and ease of handling a wide assortment of metals and alloys are other advantages of levitation melting. The molten metal stirs itself and yields unusually uniform alloys from mixtures of different metals.

Scientists are using levitation melting to prepare a wide variety of the newest metals and alloys for metallurgical research. Such research with ultrapure metals seeks the fundamental knowledge which lies behind their full-scale use as metals of the future. Thus, in the past few years, titanium has emerged from the laboratory as an important building material in supersonic aircraft and missiles, and zirconium has developed into a vital structural metal in nuclear reactors.

Although not yet out of the laboratory stage, niobium may soon become an outstanding high-temperature, high-strength structural metal. Levitation melting is one of the few methods known for the preparation of niobium and niobium-base alloys in the purity required for fundamental research on the metal.

Dean Mason Honored

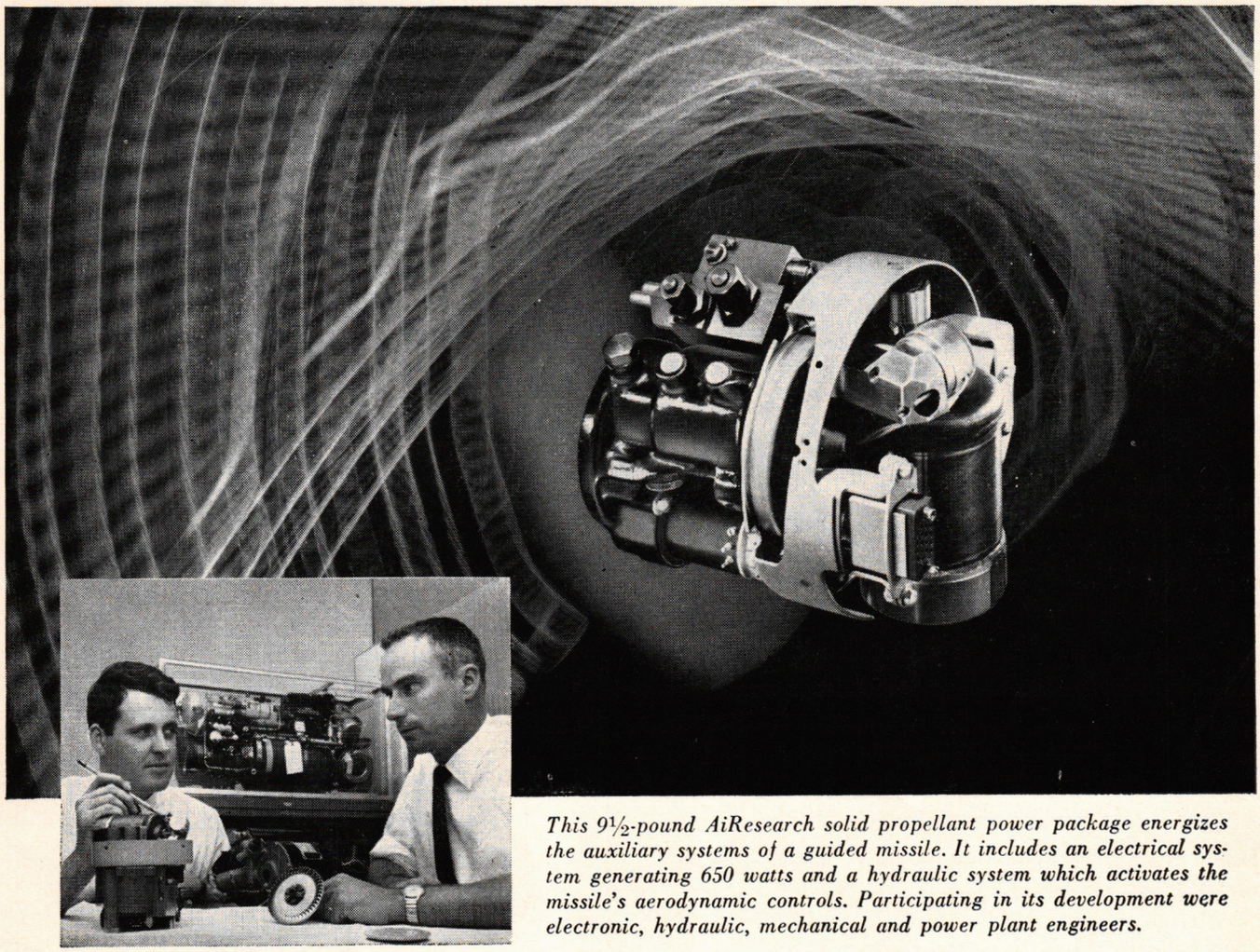
The recent election of Martin A. Mason Dean of the School of Engineering of the George Washington University, to the Board of the Engineering Foundation has brought additional prestige to the school.

The Engineering Foundation was established in 1914 to administer endowment funds for the furtherance of research in science and engineering and for the advancement of the profession of engineering and the good of mankind.

The original endowment was made by Ambrose Swasey, and since that time considerable amounts have been added. At the present time the Foundation is providing 14 million dollars from its own and other sources to aid more than a hundred projects.

The Engineering Foundation selects projects submitted to it but does not initiate them.

IF you're looking beyond tomorrow...



This 9½-pound AiResearch solid propellant power package energizes the auxiliary systems of a guided missile. It includes an electrical system generating 650 watts and a hydraulic system which activates the missile's aerodynamic controls. Participating in its development were electronic, hydraulic, mechanical and power plant engineers.

Your first position after graduation will determine the direction in which you will grow in engineering knowledge and ability.

Garrett offers engineering career opportunities which will expand for many years to come.

They include the following in the fields of aircraft, missiles and technological industry: system electronics; computers and flight instruments; gas turbine engines and turbine motors; prime engine development; cryogenic and nuclear systems; pneumatic valves; servo control units and air motors; industrial turbochargers; air conditioning and pressurization and heat transfer.

In addition to direct assignments, a 9-month orientation program is available to aid you in selecting your field of interest. This permits you to survey project, laboratory and administrative aspects of engineering at Garrett. With company financial assistance you can continue your education at outstanding universities within easy reach of your employment.

Project work is conducted by small groups where individual effort is more quickly recognized and opportunities for learning and advancement are enhanced. For full information write to Mr. G. D. Bradley.

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School of Engineering Honor List

Fall Semester 1957-58

The Faculty of the School of Engineering has provided for the recognition of meritorious scholastic achievement by the display and publication of an Honors List. The students whose names appear below have met all requirements established by the faculty for this honor during the fall semester of 1957-58.

The Honors List contains the names of candidates for an undergraduate degree in engineering whose scholastic achievement satisfies all of the following requirements:

(a) The candidate's cumulative quality-point-index is equal to or exceeds 3.0.

(b) At least 30 semester hours credit has been earned as a degree candidate in the School of Engineering.

(c) At least 15 (part-time student) or 30 (full-time student) semester hours credit in an engineering degree curriculum has been earned in the immediate two consecutive semesters.

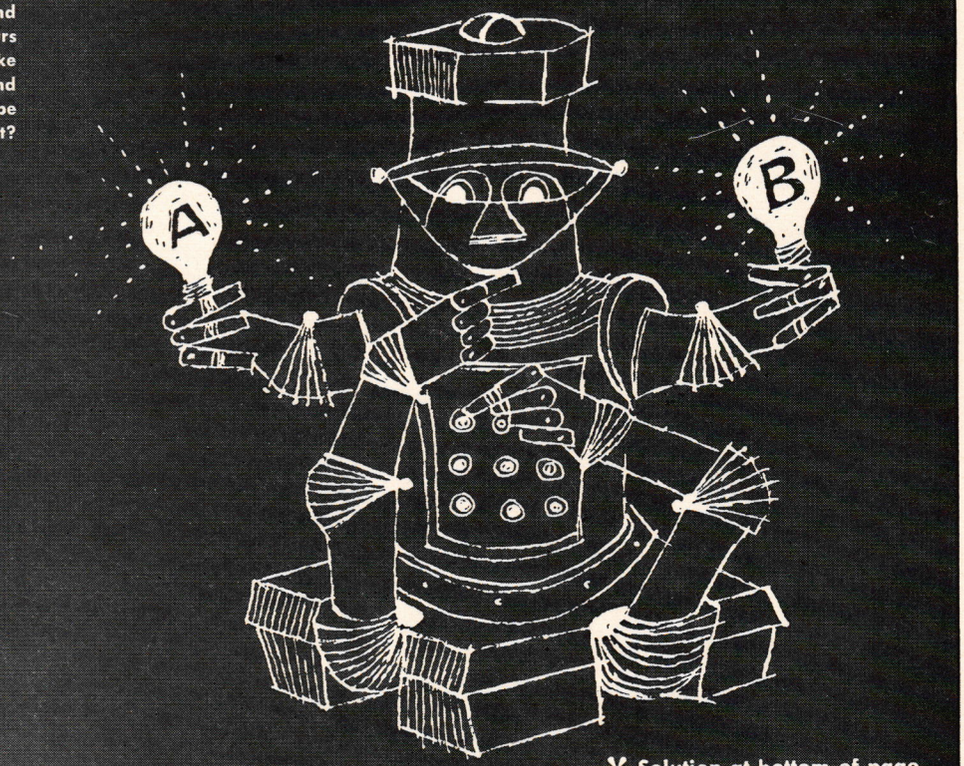
(d) No grade below C has been received during the qualifying period stated in (c) above.

(e) No disciplinary action has been taken in respect to the student.

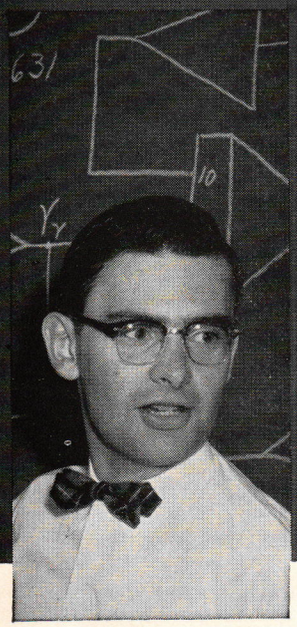
Al-Mallah, M. Y.
Barnes, L. A.
Beck, H. D.
Beuttenmuller, R. A.
Birch, T. C.
Boardway, R. A.
Browne, R. A.
Bruff, W. T.
Burnham, J. M.
Chloupek, L. A.
Clemons, Ormond
Coleman, T. W.
Davis, W.
Dietz, S. K.
Fuller, R. L.
Golab, T. J.
Grossman, R. A.
Hall, S. R.
Hui, P. S. P.
Joyce, James
Joyce, J. D.
Kaminetzky, J.
Kenyon, R.
Kransdorf, R. J.
McChesney, D. W.
Malasky, C. R.
Martin, R. G.
Mayo, H. C.
Meltzer, A. C.
Moore, R. W.
Perschy, James
Potterton, R. L.
O'Neale, J.
Renton, G. W.
Sanborn, R. L.
Sapardiman, S.
Schuler, B. C.
Smith, W. R.
Terauds, J. J.
White, D. M.
Williams, H. J., Jr.

CAN YOU FIGURE IT OUT?

A machine can turn out 20 "A" bulbs and 15 "B" bulbs per day. But, it takes 0.2 hours to make an "A" and 0.4 hours to make a "B." The profit on an "A" is $2 and on "B" $5. How many of each should be made per 8-hour day for maximum profit?



✱ Solution at bottom of page



Sherman Francisco tells what it's like to be . . . and why he likes being . . . a Computer Systems Engineer with IBM.

FIGURING OUT A CAREER?

Selecting a career can be puzzling, too. Here's how Sherman Francisco found the solution to *his* career problem—at IBM:

"*Airborne* computers present a special challenge to an engineer, because systems must be planned and designed with flight in mind. Through *simulation* studies, we test computer systems right in our own labs—simulating both the dynamics of the aircraft and the environmental conditions encountered. My biggest thrill? To see my first *simulated* bombing mission, achieved after a year and a half of planning and designing!"

* * * *

There are many excellent opportunities for well-qualified engineers, physicists and mathematicians in IBM Research, Development and Manufacturing Engineering. Why not ask your College Placement Director when IBM will next interview on your campus? Or, for information about how your degree will fit you for an IBM career,

JUST WRITE TO:

Mr. R. A. Whitehorne
IBM Corp., Dept. 853
590 Madison Avenue
New York 22, N. Y.

IBM INTERNATIONAL BUSINESS MACHINES CORPORATION

***SOLUTION**

If x and y be the number of bulbs A and B respectively, the profit (P) for a day can be represented by

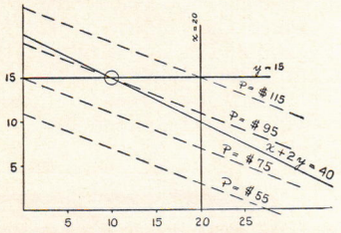
$$P = 2x + 5y$$

subject to the restrictions

$$x \leqq 20, \quad y \leqq 15$$

and also subject to the restriction that there are only 8 hours in a production day, i.e.,

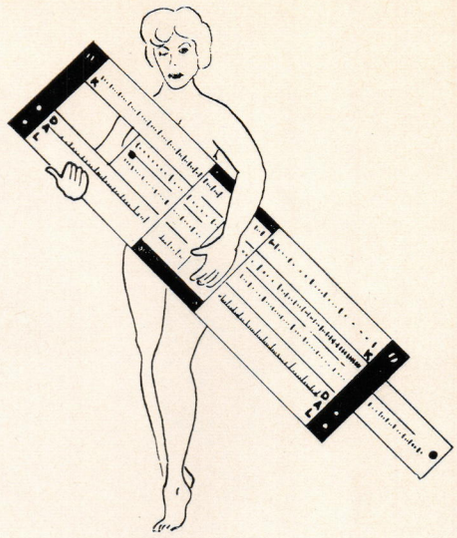
$$0.2x + 0.4y \leqq 8 \text{ or } x + 2y \leqq 40$$



Since $x \geqq 0$ and $y \geqq 0$, the values of x and y must fall on the boundary or within the polygon enclosed by the lines $x = 0$, $y = 0$, $x = 20$, $y = 15$ and $x + 2y = 40$, as shown. The optimal solution occurs at the corner where $P = \$95$. Thus the maximum possible profit is $P = \$95$ at $x = 10$, $y = 15$, i.e., when the machine produces 10 of A and 15 of B each day.

Note: This simple graph method is too cumbersome for more than 2 variables. Modern computers use numerical techniques to handle many more variables – a technique called Linear Programming.

SLIPSTICK SLAPSTICK



Imagine the newspaper boy's embarrassment when he opened the wrong door in the depot waiting room and yelled, "Extra paper!"

Judge: What's yours?
Culprit: I'm a hospital orderly.
Judge: Thirty days for panhandling.

There are only two kinds of parking left on the campus—illegal and no.

There's a new gadget that keeps the inside of our car quiet. It fits over her mouth.

An expectant father phoned the doctor to rush right over. "Is she laboring?" asked the doctor.
"Hell no!" replied the man, "She's in bed yelling her head off and I'm doing all the work."

He: "Pardon me, but you look like Helen Greene."
She: "So what? I look worse in pink."

When a man is twenty and a young lady smiles at him when passing on the street he looks himself over to see what makes him so attractive. When he is forty and a lady smiles at him, he looks around to see who is following him or what is unzipped.

A Texas oil man was visiting New York. His city friend showed him all of the sights including the Empire State building.
"Isn't that a gigantic structure?" asked the friend.
"Naw, that isn't so big," drawled the Texan, "We've got outhouses in Texas bigger than that."
"Well," drawled back the New Yorker, "I guess yuh need 'em."

Scene in a local sorority:
"My gosh, Mary, are you pregnant?"
"No, that's my new sack dress."

"I know a man who has been married thirty years and he spends every evening at home."
"That's what I call love."
"The doctor calls it paralysis."

I serve a purpose in this school
On which no man can frown.
I quietly sit alone in class,
And keep the average down.

Recent tests in the biology department prove that grasshoppers hear through their legs. When a tuning fork was placed near a grasshopper, it was found that in all cases the insect would hop. There was no reaction, however, to this stimulus when the insect's legs were removed.

Professor (pointing out cigarette butt on the floor to Woody): "Is that yours?"
"Not at all, sir, Woody replied, "you saw it first."

A car pulled up along side a couple seated in a car.
"What's the matter?" asked the intended helper, "out of gas"
"Nope," came the answer from the inside.
"Engine trouble?"
"Nope."
"Tire down?"
"Didn't have to."

Some engineering students spend part of their money on liquor and part on women . . . the rest they spend foolishly.

Legally the husband is the head of the house and the pedestrian has the right of way. Both are fairly safe unless they try to exercise their rights.

The farmer's boy who used to growl at the cows as he drove them up, now stands wide-eyed at the corner appraising the calves.

Vince: "Why did you flunk that class?"
D. B.: "Illness, the prof got sick of me."

The husband and wife were reminiscing:
He—Remember the good old days when I was sixteen and you were fourteen?
She—Yes, yes.
He—Well, now I'm forty-five and you're eighteen.

Sam was stopped for doing 80 on the parkway. "I wasn't going eighty miles an hour," he protested. "I wasn't even doing forty. In fact I wasn't even doing fifteen." So the cop gave him a ticket for parking on the highway.

The cutest little dog came to school with Woody every day, but one day they finally separated. The dog graduated.

Overheard in Union: "Every time I meet a girl either she's married or I am."

Dress styles may change but I hear that they still wear the same things in brassieres.

She was so beautiful that when Jim took her home in the taxi he could hardly keep his eyes on the meter.

One male to another as they watched a girl go by in a chemise: "She looks like a kept woman—like she had been kept under a rock."

It was the day after their wedding. He took her in his arms and said, "Darling, now that we're married, I must tell you a few little defects I've noticed about you."
"Well," she answered, "it was those little defects that kept me from getting a better husband!"

Me—How'd you meet your husband?
She—I was on the beach and asked him for a match. He said he'd give me a match if I'd give him a kiss.
Me—Boy, what a guy could do with a lighter!

The new recruit didn't salute the colonel. "Do you realize who I am?" asked the officer. "I run this entire camp. I'm in charge of twenty-five thousand soldiers."
"You got a good job," said the private, "don't louse it up."

1,000 styles—750 stores—yet photography gives headquarters inventory figures overnight

Thom McAn ends ten-day hand-copying jobs with Kodak's Verifax Copier—now gets complicated sales, size and style data off in a day.

BEFORE, when Thom McAn's merchandise manager or stylist needed word on sales or style trends in certain stores, it took as much as ten days to hand-copy the records.

But today, when headquarters located in New York requests information on any shoe style or store, the New England merchandising center gets the latest facts and figures away in that night's mail. And styling, buying and distributing functions get 24-hour—instead of ten-day—service on vital stock allotment statistics.

This is because the facts, kept on files of removable panels and cards, can be slipped into a Kodak Verifax Copier and copied, photographically accurate, in a minute.

Photocopying is just one of hundreds of ways photography works today for all kinds of businesses, large and small. It helps with product design, takes kinks out of production, increases sales, improves customer and personnel relations.

Thom McAn calls the Verifax Copier "the kingpin of the allotment control system." It copies a store's style allotment records and width breakdowns and in less than 60 seconds has a dry print ready for the mails.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

CAREERS WITH KODAK

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Kodak
TRADE MARK

One of a series*

Interview with General Electric's Earl G. Abbott Manager—Sales Training

Advancement in a Large Company: How it Works

Where do you find better advancement opportunities—in a large company or a small one? To help you, the college student, resolve that problem, Mr. Abbott answers the following questions concerning advancement opportunities in engineering, manufacturing and technical marketing at General Electric.

Q. In a large Company such as General Electric, how can you assure that every man deserving of recognition will get it? Don't some capable people become lost?

A. No, they don't. And it's because of the way G.E. has been organized. By decentralizing into more than a hundred smaller operating departments, we've been able to pinpoint both authority and responsibility. Our products are engineered, manufactured and marketed by many departments comparable to small companies. Since each is completely responsible for its success and profitability, each individual within the department has a defined share of that responsibility. Therefore, outstanding performance is readily recognized.

Q. If that's the case, are opportunities for advancement limited to openings within the department?

A. Not at all. That's one of the advantages of our decentralized organization. It creates small operations that individuals can "get their arms around", and still reserves and enhances the inherent advantages of a large company. Widely diverse opportunities and promotions are available on a Company-wide basis.

Q. But how does a department find the best man, Company-wide?

A. We've developed personnel registers to assure that the best qualified men for the job are not overlooked. The registers contain complete appraisals of professional employees. They enable a manager to make a thorough and objective search of the entire General Electric Company and come up with the man best qualified for the job.

Q. How do advancement opportunities for technical graduates stack-up with those of other graduates?

A. Very well. General Electric is recognized as a Company with outstanding technical skills and facilities. One out of every thirteen employees is a scientist or engineer. And approximately 50 per cent of our Department General Managers have technical backgrounds.

Q. How about speed of advancement? Is G.E. a "young man's Company"?

A. Definitely. A majority of all supervisors, managers and outstanding individual contributors working in the engineering function are below the age of forty. We believe that a job should be one for which you are qualified, but above all it should be one that challenges your ability. As you master one job we feel that consideration should be given to moving you to a position of greater responsibility. This is working, for in the professional field, one out of four of our people are in positions of greater responsibility today than they were a year ago.

Q. Some men want to remain in a specialized technical job rather than go into managerial work. How does this affect their advancement?

A. At G.E. there are many paths which lead to higher positions of recognition and prestige. Every man is essentially free to select the course which best fits both his abilities and interests. Furthermore, he may modify that course if his interests change as his career progresses. Along any of these paths he may advance within the Company to very high levels of recognition and salary.

Q. What aids to advancement does General Electric provide?

A. We believe that it's just sound business policy to provide a stimulating climate for personal development. As the individual develops, through his own efforts, the Company benefits from his contributions. General Electric has done much to provide the right kind of opportunity for its employees. Outstanding college graduates are given graduate study aid through the G-E Honors Program and Tuition Refund Program. Technical graduates entering the Engineering, Manufacturing, or Technical Marketing Programs start with on-the-job training and related study as preparation for more responsible positions. Throughout their G-E careers they receive frequent appraisals as a guide for self development. Company-conducted courses are offered again at all levels of the organization. These help professionals gain the increasingly higher levels of education demanded by the complexities of modern business. Our goal is to see every man advance to the full limits of his capabilities.

If you have other questions or want information on our programs for technical graduates, write to E. G. Abbott, Section 959-9, General Electric Co., Schenectady 5, N. Y.

***LOOK FOR other interviews discussing: • Qualities We Look For in Young Engineers • Personal Development • Salary.**

GENERAL ELECTRIC